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EXAMINER

UHLIR, NIKOLAS J

ART UNIT	PAPER NUMBER
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1773

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DATE MAILED: 01/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/816,548

Applicant(s)

OHMORI, HIROYUKI

Examiner

Nikolas J. Uhler

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 17 and 18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☒ Claim(s) 1-18 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-16, drawn to a magnetic recording medium, classified in class 428, subclass 694TS.
 - II. Claims 16-17, drawn to a method for manufacturing a magnetic recording medium, classified in class 427, subclass 532 and class 204, subclass 192.2.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product could have been made by another and materially different process, such as forming the non-magnetic metal ground layer and the magnetic layer under conditions of $>100^{\circ}$ C.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Ronald Kananen on 1/07/03 a provisional election was made with traverse to prosecute the invention of the product, claims 1-16. Affirmation of this election must be made by applicant in replying to this Office action.

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Claims 17-18 are withdrawn from further consideration by the examiner, 37

CFR 1.142(b), as being drawn to a non-elected invention.

Priority

5. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

6. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. **The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided.** The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

7. The abstract of the disclosure is objected to because it contains legal phraseology. Specifically, the abstract contains the term "comprising." Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 2, 4-6, 9-12 and 15-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the

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subject matter which applicant regards as the invention. In the instant case, claim 2 requires that the non-magnetic layer be formed by layering a plurality of layers which have different compositions from each other. It is unclear from the claim language whether the applicant is requiring that each of the layers in the "plurality" must contain 20 or more atomic % Ru, as required by claim 1. Clarification is required.

10. Claims 4-6, 9-12, and 15-16 utilize improper markush group terminology. Specifically, the phrases "material selected from," and "group of," are improper. Replacement of these phrases with language such as "material selected from the group consisting of" is sufficient to correct this issue.

11. Further, claim 9 requires that the non-magnetic metal ground layer be constructed by at least one kind selected from oxide, nitride, carbide, and carbon formed in a granular structure. It is unclear from the claim language whether the applicant intends that the non-magnetic metal ground layer be formed entirely of one of the oxides listed, or merely to additionally contain one of them. Claim 10, by virtue of being dependent on claim 9 is rejected therewith. Correction of claim 9 will result in the withdrawal of this rejection for both claims 9 and 10.

12. Additionally, it is unclear exactly what claim 16 requires, as the claim language is confusing. It is unclear to the examiner whether claim 16 is requiring that the separation layer simply be one of the oxides, nitrides, or carbides listed, a mixture of one of these oxides, nitrides, or borides with one of the elements listed earlier in claim 16, or whether the separation layer is formed of Ru or an Ru alloy (as required by claim 15), and

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further contains either an oxide, nitride, or carbide, or a mixture of an oxide, carbide, or nitride and one of the elements listed. Clarification is required.

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

14. Claims 1-4, and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Futamoto et al. (US6383667).

15. Regarding the limitations of claim 1, wherein the applicant requires a magnetic recording medium comprising: a non-magnetic substrate; a non-magnetic metal ground layer formed on a main surface side of the non-magnetic substrate and containing ≥ 20 at. % Ru; and a magnetic layer formed on the non-magnetic metal ground layer and having a metal magnetic thin film.

16. To be clear on the record, it should be noted that the examiner, while interpreting the claims in light of the specification, must also give the claims their broadest reasonable interpretation. Bearing this in mind, the applicant should note that the examiner interprets "formed on" as recited in the instant claims to allow for additional layers to be present between one layer and another layer that the first layer is "formed

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on." More succinctly, "formed on" is not interpreted by the examiner as "directly adjacent to," or "directly on the surface of" another layer.

17. With respect to the limitations of claim 1, Futamoto et al. teaches a magnetic recording medium meeting applicant's claim 1 requirements. Specifically, Futamoto et al. teaches a magnetic recording medium that comprises a substrate (equivalent to applicants non-magnetic substrate), a first underlayer having a B2 crystal structure on the substrate, a second underlayer comprising a Co-Ru_x-Cr_y alloy, wherein x is 5-65 atomic % and y is 0-35 at. %, on the first underlayer, and a magnetic layer on the second underlayer (column 13, lines 32-60). In specific embodiments, Futamoto et al. teaches suitable compositions for the second underlayer include CoRu alloys, with the amount of Ru in the alloy as high as 75 at. % (column 16, lines 21-41). Thus, Futamoto et al. anticipates all of the limitations required by the instant claim 1.

18. Regarding the limitations of claim 2, wherein the applicant requires that the non-magnetic metal ground layer be constructed by layering a plurality of layers that have different compositions from one another. The examiner interprets the term "plurality," to mean, "two or more." In light of this interpretation, it is noted that in addition to the details stated above for claim 1, Futamoto et al. teaches suitable materials for the first underlayer include NiAl, FeAl, FeV, etc. (Column 13, lines 32-40). Thus, Futamoto et al anticipates the limitations of claim 2 as two underlayers having different compositions are utilized.

19. Regarding the limitations of claim 3, wherein the applicant requires the non-magnetic metal layer to have a graded composition in which a composition of the non-

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magnetic metal ground layer change sequentially in a film thickness direction. The examiner interprets this claim to require that the concentration of at least one element in the non-magnetic metal layer changes sequentially over the thickness of the film. With this in mind, Futamoto et al. teaches that an intermediate underlayer of Cr is present between the 1st underlayer and the second underlayer (column 13, lines 50-55). This results in an underlayer having the structure B2/Cr/CoRu_xCr_y. The examiner takes the position that the limitations of claim 3 are met when a CoRu_xCr_y alloy that contains **any** amount of Cr (many of which are detailed at column 16, lines 30-48) is utilized, as this would result in an underlayer that has a change in the chromium concentration over the film thickness. Thus, the limitations of claim 3 are met.

20. Regarding the limitations of claim 4, wherein the applicant requires that the non-magnetic metal ground layer be made of an alloy of Ru and at least one of the elements listed, wherein the composite ratio of Ru in the alloy is 50 at% or more. The examiner interprets "composite ratio" to simply mean "the amount of Ru." With respect to these limitations, Futamoto et al. teaches alloys of Co and Ru, wherein the amount of Ru is ≥ 50 at. % or more are suitable for the second underlayer (column 16, lines 21-42). As Co is listed as one of the elements to be alloyed with Ru in claim 4, the limitations of claim 4 are met.

21. Regarding the limitations of claim 12, wherein the applicant requires the magnetic layer to contain at 0.5-25 at. % of at least one kind of material selected from the elements listed. In a specific embodiment, Futamoto et al. utilizes CoCr₁₇Pt₂₀Ta₃ as the magnetic layer, wherein the subscripts are in atomic % (column 18, lines 3-12). As

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Cr and Ta are listed in claim 12 as suitable elements for incorporation into the magnetic layer. Thus the limitations of claim 12 are met.

Claim Rejections - 35 USC § 103

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

23. Claims 5, 11, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto et al. as applied to claim 1 above, further in view of Honda et al. (US5851643).

24. Futamoto et al. does not teach a magnetic recording medium utilizing a non-magnetic metal ground layer made of an alloy of Ru and at least one kind of material selected from W, Mo, V, Nb, and B, wherein the composite ratio of Ru in the alloy is 20 at % or more.

25. However, Honda et al. teaches a magnetic recording medium that utilizes a structural control underlayer (similar to Futamoto et al.'s 2nd underlayer) that is formed of HCP structure materials comprising an alloy of Ti, Ta, Ru, Hf, or Co materials with Cr, V, or W (column 6, lines 44-50)

26. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to substitute W or V as taught by Honda et al. for the Cr in the CoRu_xCr_y material taught by Futamoto et al.

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27. One would have been motivated to make this modification due to the fact that the 2nd underlayer of Futamoto et al. is HCP alloy of Co, Ru, and Cr (see column 14, lines 5-10 of Futamoto et al.), and the fact that Honda et al. teaches the equivalence of adding Cr, V and W to HCP alloys. Applicants are respectfully reminded that substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In Re Fount* 213 USPQ 532 (CCPA 1982); *In Re Siebentritt* 152 USPQ 618 (CCPA 1967); *Grover Tank & Mfg. Co. Inc V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950)

28. Futamoto et al. does not teach a magnetic recording medium wherein the magnetic layer is constructed by a plurality of metal magnetic thin films, with at least one intermediate layer inserted there between, wherein the intermediate layer is made of at least one kind of material selected from Pt, Pd, and Ni, as required by claim 11. Further, Futamoto et al. does not teach utilizing an intermediate layer of Ru or Ru alloy as required by claim 15.

29. However, Honda et al. teaches that a magnetic recording medium that exhibits reduced read back noise can be formed by utilizing a magnetic film that is formed by laminating two magnetic layers together with an intervening non-magnetic layer (column 9, lines 55-64).

30. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to utilize the multilayer magnetic film taught by Honda et al. as the magnetic layer in Futamoto et al.

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31. One would have been motivated to make this modification due to the teaching Honda et al. that using a multilayer magnetic film reduces the read back noise of a recording medium.

32. Honda et al. teaches that materials that are suitable for the intermediate layer in the multilayer magnetic layer include Ru, Pt, or Pd (column 17, lines 54-61).

33. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to utilize Ru, Pt or Pd as the intermediate layer in the multilayer magnetic film utilized in Futamoto et al. as modified by Honda et al. due to their equivalence as suitable materials for the intermediate layer.

34. Thus, the limitations of claim 11 are met when Pt or Pd is utilized as the intermediate layer, and the limitations of claim 15 are met when Ru is utilized as the intermediate layer.

35. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto et al. as applied to claim 1 above, and further in view of Shiroishi et al. (US4833020).

36. Futamoto et al. does not teach a non-magnetic metal ground layer made of an alloy of Ru and at least one of Cu, Ni, Pd, Pt, Y, and C, wherein the amount of Ru in the alloy is ≥ 80 at. %, as required by claim 6.

37. However, Shiroishi et al. teaches a magnetic recording medium that comprises a substrate, a first underlayer, a second underlayer, and a magnetic layer, wherein the second underlayer comprises an element selected from Cr, Mo, W, Ru, Os, Pd, V, Nb, Hf, Rh, Pt, or Ir and up to 20% of an element selected from Zr, Si, Ti, Y, Sc, Al, C, Ge, Sb, And Cu. Shiroishi et al. teaches that magnetic media with improved signal to noise

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ratio are formed when a second underlayer of this type is utilized (column 2, line 13-column 3, line 2).

38. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to substitute an Ru underlayer containing up to 20 atomic % of Cu or C as taught by Shiroishi et al. for the CoRu underlayer taught by Futamoto et al.

39. One would have been motivated to make this modification due to the teaching in Shiroishi et al. that magnetic media exhibiting improved signal to noise ratio are formed when a second underlayer comprising an alloy of Ru with up to 20 atomic % of C or Cu is utilized. Regarding the specific selection of Ru, Cu and C, Ru is taught to be equivalent to the other elements listed as suitable for the main component of the second underlayer, and Cu or C are taught to be equivalent to the other elements listed as suitable for the secondary components of the second underlayer. Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In Re Fount* 213 USPQ 532 (CCPA 1982); *In Re Siebentritt* 152 USPQ 618 (CCPA 1967); *Grover Tank & Mfg. Co. Inc. V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

40. Claims 7-8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto et al. as applied to claim 1 above, and further in view of Suzuki et al. (US6335103)

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41. Futamoto et al. does not teach a non-magnetic metal ground layer that contains oxygen and or nitrogen, as required by claim 7, specifically 0.2-10 at. % O or N, as required by claim 8.

42. However, Suzuki et al. teaches that adding 0.1-10 at. % of oxygen to a non-magnetic underlayer of a magnetic recording medium reduces the grain size of the underlayer, which in turn reduces the noise of a magnetic layer deposited on the underlayer (column 11, lines 38-46)

43. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to add 0.1-10 at. % oxygen as taught by Suzuki et al. to the CoRu_xCr_y underlayer taught by Futamoto et al..

44. One would have been motivated to make this modification due to the teaching in Suzuki et al. that adding 0.1-10 at. % oxygen to an underlayer of a magnetic recording medium reduces the grain size of the underlayer, thus reducing the noise of a magnetic layer disposed on the underlayer.

45. Futamoto et al. does not teach a magnetic layer that contains 0.2-15 at. % oxygen or nitrogen, as required by claim 13.

46. However, Suzuki et al teaches that adding 0.1-15 at. % oxygen to a magnetic layer of a magnetic recording layer reduces the grain size of the magnetic layer, thereby reducing the noise of the recording medium (column 3, line 67-column 4, line 5).

47. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to add 0.1-15 at% oxygen as taught by Suzuki et al to the magnetic layer of Futamoto et al.

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48. One would have been motivated to make this modification due to the teaching in Suzuki et al. that adding oxygen to the magnetic layer of a recording medium improves the noise of the medium.

49. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto et al. as applied to claim 1 above, and further in view of Wu et al. (US6218003).

50. Futamoto et al. does not teach a non-magnetic metal ground layer that contains at least one material selected from oxides, nitrides, carbides, and carbon, as required by claim 9, specifically one of the oxides, nitrides, or carbides listed by claim 10.

51. However, Wu et al. teaches that the recording density, coercivity, signal to noise ratio, and signal pulse characteristics of a magnetic recording medium can be improved by adding TiO_2 to a Cr alloy underlayer utilized in the media (column 3, lines 1-7).

52. Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to add TiO_2 as taught by Wu et al. to the CoRu_xCr_y alloy underlayer taught by Futamoto et al.

53. One would be motivated to make such a modification due to the teaching in Wu et al. that the magnetic properties of a magnetic recording medium can be improved by adding TiO_2 to a Cr alloy underlayer utilized in the formation of the media, and the fact that the CoRu_xCr_y underlayer utilized in Futamoto et al. is a Cr alloy underlayer.

54. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto et al. as applied to claim 1 above, and further in view of Ranjan et al. (US5976326).

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55. Futamoto et al. does not teach a magnetic layer that contains an oxide, nitride, boride, or carbide, formed in a granular structure, as required by claim 14.

56. However, Ranjan et al. teaches that adding an oxide or nitride to the magnetic layer of a magnetic recording medium reduces the amount of media noise exhibited by the medium (column 4, lines 30-38).

57. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate an oxide or nitride as taught by Ranjan et al. into the magnetic layer of Futamoto et al.

58. One would have been motivated to make such a modification due to the teaching in Ranjan et al. that adding an oxide or nitride into the magnetic layer of a recording medium reduces media noise.

59. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Futamoto et al. modified by Honda et al. as applied to claims 1 and 15 above, and further in view of Ishikawa et al (US5750230). For the purpose of this examination, the examiner interprets claim 16 to require the separation layer to be one of the oxides, nitrides, or carbides listed, or a mixture of an oxide, nitride, or carbide with one of the elements listed earlier in the claim. Please see the section above for a discussion of the 112 issues in this claim.

60. Futamoto et al. as modified by Honda et al. above does not teach a separation layer comprising one of the oxides, nitrides, or carbides listed in claim 16, or a mixture of one of these compounds with one of the elements listed in group 1 of claim 16.

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61. However, Ishikawa et al. teaches that a recording medium utilizing multiple magnetic layers exhibiting improved noise and sliding strength is formed when an intermediate layer comprising an oxide or nitride of Si (i.e. SiO_2 , Si_3N_4) is used to separate the magnetic layers (column 7, lines 30-column 8, line 15).

62. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize an oxide or nitride of Si as taught by Ishikawa et al. as the intermediate layer used in Futamoto et al. modified by Honda et al.

63. One would have been motivated to make such a modification due to the teaching in Ishikawa et al. that the noise and sliding characteristics of a recording medium are improved by using an oxide or nitride of Si to separate the magnetic layers from one another.

64. Regarding the specific selection of Si from the elements listed in Ishikawa et al. Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In Re Fount* 213 USPQ 532 (CCPA 1982); *In Re Siebentritt* 152 USPQ 618 (CCPA 1967); *Grover Tank & Mfg. Co. Inc V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhler whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers

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for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.



nju

January 7, 2003



STEVAN A. RESAN
PRIMARY EXAMINER